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ABSTRACT

Five papers from the sessions of the International Federation of Library Associations and Institutions 1992 conference on classification, indexing, and cataloging are presented. Three papers deal with knowledge classification as it relates to database design, as it is practiced in India, and in a worldwide context. The remaining two papers focus on training catalogers and educating users. The following papers are included: (1) "Application of S. R. Ranganathan's Postulates and Principals of the General Theory of Knowledge Classification to Database Design and Information Retrieval" (A. Neelameghan); (2) "Classification and Indexing in India: A State-of-the-Art" (M. P. Satija); (3) "Guidelines for Subject Authority and Reference Entries (GSARE): A First Step to a Worldwide Accepted Standard" (Werner Stephan); (4) "Training Non-Cataloguers about Cataloguing" (Barbara J. Ford); and (5) "Educating Users about Catalogues and Cataloguing: The Impossible Dream" (Sharon A. Hogan). References follow most papers. (SLD)

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Application of S.R. Ranganathan's Postulates and Principles of the General Theory of Knowledge Classification to Database Design and Information Retrieval

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APPLICATION OF S.R.RANGANATHAN'S POSTULATES AND PRINCIPLES OF THE GENERAL THEORY OF KNOWLEDGE CLASSIFICATION TO DATABASE DESIGN AND INFORMATION RETRIEVAL

A. Neelameghan*

S.R. Ranganathan's postulates and principles of the General Theory of Knowledge Classification, especially the analytico-synthetic methodology can be applied with advantage in structuring knowledge bases and object-oriented databases and organization of concepts in such information bases; designing schemes for classification and vocabulary control tools, such as, thesauri; generating various types of structured indexes; assisting user browsing in database/retrieved records, facet analysis of user's queries for better results in online retrieval; presenting retrieved records in a helpful sequence, etc. The paper briefly considers applications of the analytico-synthetic methodology and related postulates and principles to the design of specialized object-oriented databases. Enhancement of user-friendliness of information retrieval by interfacing facet-analyzed query terms with thesaurus terms is demonstrated. Also, the usefulness of Ranganathan's generalized subject structure conforming to the analytico-synthetic freely faceted model is mentioned.

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APPLICATION OF S.R.RANGANATHAN'S POSTULATES AND PRINCIPLES OF THE GENERAL THEORY OF KNOWLEDGE CLASSIFICATION TO DATABASE DESIGN AND INFORMATION RETRIEVAL

A. Neelameghan

INTRODUCTION

Ranganathan's Holistic Integrative Approach

01 In any discussion of S.R.Ranganathan's approach to the design, development and use of information systems and services or a component thereof, it is necessary and helpful to bear in mind his holistic integrative approach. For the purpose of strenthening and achieving consistency in this regard, Ranganathan recommended use of a range of normative principles (13), proposed a typology among them establishing a hierarchy among the types or groups and suggested guidelines for their application. Briefly, the group of normative principles include:

Level 1: Basic Laws, (Law of Symmetry, Law of Impartiality, Law of Context/Local Variation, Laws of Interpretation and Law of Parsimony) applicable to intellectual work in all areas of the universe of knowledge;

Level 2: Fundamental Laws, (e.g. Laws of Physics, Laws of Biology, and the Five Laws of Library Science postulated by Ranganathan) applicable to a discipline as a whole;

Level 3: Canons, (e.g. Canons of Classification in Library Science) applicable to a branch of a discipline; and

Level 4: Principles, (e.g. Principles of Facet Sequence in Classification), applicable to a sub-branch or subdivision of a branch of a discipline.

Ranganathan provided also several postulates applicable at each of the above levels. His Five Laws of Library Science (11) which

are information use and user-oriented, direct that any new principle, technique or strategy adopted should lead to users obtaining more pertinent information expeditiously when needed, presented in a form and format convenient to the target user group, saving of users' time and ensure a more efficient management of the information system and service, than was the case before the application of the new technique, etc.

Applications of Analytico-synthetic Methodology

02 Ranganathan's General Theory of Knowledge Classification, the postulates and principles and especially the analytico-synthetic freely-faceted methodology, which this paper will be discussing, have several applications, for example, in:

- structuring knowledge bases and object-oriented databases and organizing concepts therein in a helpful sequence;
- object-oriented analysis and design;
- preparing field definition table for database;
- designing schemes for classification;
- designing vocabulary control tools, such as, subject heading lists, thesaurus, classaurus, etc.;
- generating various types of structured indexes;
- assisting user browsing more conveniently in the database or retrieved records to zero-in on the specific subjects/objects of interest to him/her at the moment;
- facet-analysis of user's query and structuring search expressions for better results in online retrieval; and
- presenting retrieved records/information in a sequence helpful to users.

Scope of the Paper

03 Some of the above applications have been discussed in other recent papers (8,9,10). The present paper briefly considers the applications of Ranganathan's analytico-synthetic methodology and the related postulates and principles of his General Theory of Knowledge Classification to the design and development of databases, specialized and object-oriented databases in particular, and in information retrieval. Usefulness of Ranganathan's generalized subject structure conforming to the analytico-synthetic freely-faceted model is also mentioned. Enhancement of the user-friendliness of information systems by interfacing facet-analyzed query terms with thesaurus terms is demonstrated.

04 Databases mentioned in this paper are mostly object-oriented factual information bases. However, Ranganathan's subject structure model, analytico-synthetic approach and the related postulates and principles are applicable to the organization of subjects embodied in documents as in a bibliographic database.

WORKING DEFINITIONS

05 Data entity: A data entity is a set of objects that share one or more attributes in common among themselves and about which one may be interested in collecting descriptive data. The descriptive data collected about an entity is usually data about attributes of the entity or attribute data (8).

06 Data model: A data model is a schema to represent the real world of data entities using information concepts and structure. For example, in databases to support decision making and planning by an aid agency relating to rural development in a country the

real world 'target community' may be represented by information concepts, e.g. demographic pattern, economic indicators, social factors, ethnic factors, literacy levels, infrastructure, growth poles, etc (8).

07 Subject: A subject is an organized or systematized account of an entity or set of entities (an idea or group of ideas) whose extension and intension are likely to fall coherently within the field of interest and comfortably within the intellectual competence and the field of inevitable specialization of a normal person (12). For example, 'Coordination of Aid from the European Communities for Famine Relief in Bangladesh', 'Famines in Asia', 'Disaster Relief Work', and 'Sociology' is each a subject; for, the intension and extension of the totality of ideas comprehended by each of the terms or term combinations can form a coherent, comfortable and convenient field of specialization of a normal person. On the other hand, not all of what is embodied in the 'Encyclopedia of Social Sciences' taken as a whole is a subject; for, the totality of all the ideas embodied therein cannot form a coherent, comfortable and convenient field of specialization of a normal person. It is a collection of descriptions of a large number of subjects.

ORGANIZATION OF IDEAS IN SPECIALIZED DATABASES

08 Concept categorization and knowledge organization are used, in one form or another, in knowledge bases (e.g. specialized and object-oriented databases). Such organization of concepts also helps in recognizing the types of inter-relationship that may

exist among concepts in the particular context of a subject, and in linking them accordingly with a view to assisting users browse and navigate more conveniently in the knowledge base; and in presenting the retrieved records or ideas in a sequence helpful to users. Ranganathan's analytico-synthetic method based on postulates and principles is helpful in deriving a more or less consistent concept categorization and knowledge organization in data bases and their outputs. The resulting representation of subject/object has a higher heuristic value in browsing to zero-in on the specific entity/subject of interest to them at the moment. The facet syntax so arrived at is deemed to parallel more closely the way in which a majority of normal intellectuals arrange the component ideas of a subject when thinking, communicating, or seeking information about the subject (7). Hence, users are likely to find the system more user-friendly than would be the case if the concept terms (descriptors) are placed any which way like 'peas in a bag', other aspects of the system remaining the same (5). In a database consisting of case histories of hospital patients, developed by doctors who were also users of the system and who have not had any exposure to Ranganathan's postulates, principles and analytico-synthetic method, the grouping and organization of the database fields and their preferred sequence conformed to those that would have been arrived at by applying Ranganathan's analytico-synthetic methodology and the related postulates and principles (10). A similar preference by specialists in forest management has been noted with the database on forests. Also, the analytico-synthetic methodology has been used in conceptualizing, mapping and visualizing in convenient framework issues/concepts/

data entities of interest to specialized users (e.g. energy resource planners). The framework could be translated into fields of a database or schedules in a scheme for classification (8). These and other examples of organization of concepts in databases of expert systems (15,16) indicate that the principles and postulates of the General Theory of Knowledge Classification make explicit the sequencing of ideas in the thinking process of specialists and thus provide general guidance for deriving consistent and helpful organization of ideas in specialized databases.

GENERALIZED SUBJECT STRUCTURE MODEL

09 Ranganathan's generalized model of subject structure (7,9):

a) conforms to the definition of subject given in para 07;

b) helps to minimize the range of search/browsing necessary in a set of records, to zero-in on the specific subject(s) of interest to the user at the moment;

c) the power to discriminate/distinguish between specific subjects falling in different subject areas rests with the first component in the linear representation of subject, namely, the 'Object of Study' or Personality facet (9); and

d) is object or entity oriented (cf. Object-oriented Analysis and Design), implying that information seekers in general are interested in information about the attributes (Properties) of an object or entity (concrete or abstract) with a view to using, or manipulating, or changing the attributes; or in finding out which object(s)/entity(ies) possess given property(ies), or particular values for the selected attributes. Examples:

(1) From a database on Syndromes, doctors may wish to know

which disease(s) manifest a combination of the symptoms:

congenital; cyanosis; clubbling of fingers; clubbing of toes

(2) From a database of hospital patients records, doctors may wish to know which patient(s)/disease(s) show a particular symptoms or a combination of given symptoms.

(3) From a database of socio-economic development indicators for the constitutent states of a country, planners or researcher may wish to know which constituent states have particular values for a given set of indicators.

(4) From a database of profiles of small enterprises, users may wish to know alternative means of financing small enterprises in a particular country or state? Or may want comparative data on small enterprises in a particular area (e.g. constituent state of India) receiving following types of funding and/or subsidies:

Term loan, State subsidy, Promoter's share, Soft loan, Seed capital, Development loan, Deferred payment loan, IFCI subsidy, IDBI subsidy, EDP subsidy, DIC subsidy etc.

DESIGNING SPECIALIZED DATABASES

10 It has been shown that there is much similarity in the steps for designing a scheme for classification and those of a specialized database. Therefore, the postulates, canons and principles of the General Theory of Knowledge Classification can be used in designing specialized databases with advantage. More specifically, application of Ranganathan's Canons of Characteristics in defining fields of Field Definition Table (FDT) of databases has been illustrated (8).

11 A database is made up of one or more files; a file is made up of one or more records; a record is made up of one or more fields

and a field is composed of one or more data elements. A designer of an information storage and retrieval system starts with deciding on (defining) what data elements should make up which field on the basis of analysis of user needs, organizational analysis, the type of data model adopted and other parameters. Which set of fields should make up a record is another decision to be taken. Ranganathan's Canons for Characteristics and postulate-based analytico-synthetic methodology are helpful in these decisions. In specialized databases, generally each record consists of fields each providing information on one or more attributes and methods of studying or manipulating them, relating to an object/entity of study (Personality facet) as illustrated in the following Object-oriented databases (8,10):

Database on/for	Object of Study	Master Record Devoted To	Fields on Attributes
Forest resources management	Forest (division)	Forest division	Of Forest Division
Market for nonconventional energy	Nonconventional energy source	Energy source	Of Market for Energy Source
Biogas equipment	Biogas equipment	Biogas equipment	Of Biogas Equipment
Syndromes	Syndrome	Syndrome	Of Syndromes
Patients records	Patient	Patient	Of Patient
Toxicity of chemicals	Chemicals	Chemicals	Of Chemical Substance
Small industries	Small industry	Small industry	Of Small Industries

12 Users may also need comparative data on the attributes of the different objects of study which may be in different records. For example, from the Forest database, in which each record gives data on the attributes of a Forest Division, user may want to get comparative data on different forest products or acreage cultivated in the different Forest Divisions. The extraction of such data from the different records and presenting them to user in a helpful format can be time-consuming with manual files or records. On the other hand, with a computerized database such extraction and presentation is easier; it is a matter of designing suitable display format(s). An example from the Forest database is given in Annex 1.

INDEXES

13 Information storage and retrieval systems find it useful to provide alphabetical subject indexes as a means of fast access to the information contained in databases. The subject index may be a part of a single inverted file (author, title, subject, etc.) or a separate file. The helpfulness of the subject index entries to users depends in a large meas re on how adequately the subject content (ideas) of each document (if a bibliographical database) or the information about the entity described (if an issue or object-oriented database) has been analyzed and represented precisely and comprehensively in the index structures or expressions Such analysis and representation can be aided by Ranganathan's analytico-synthetic procedure. The Chain Procedure is one such methodology. In its first formulation in 1937, the subject index entries were derived from the corresponding Colon Class Number.

As the latter was based on facet analysis of the subject of the document, each component idea and to some extent the nature of relationship among the ideas, could be represented in the class number and therefore the subject index entries represented near-precisely the specific subject(s) of the document. But when Chain Procedure is applied to class numbers that did not represent all component ideas of a subject of a document, it results in subject index entries that are less precise and therefore less helpful in retrieval.

12 In a paper published in 1964 (14), Ranganathan clarified that the work of facet analysis of subject of a document and expressing it precisely by synthesis of the component ideas using relevant postulates and principles so as to map the specific subject onto a data model for linear representation, must be done before a class number is assigned according to a scheme for classification, and that the expression of the specific subject can be used to derive subject index entries. Thus, the derivation of subject index entries was clearly separated from the class number. Using the precise expression(s) of the subject(s) (1) or information on the object or issue discussed, a computer can generate a variety of index entries (KWOC, PRECIS-type, POPSI, etc. (2-4). The facet-analyzed expression of subject can be used in the database record in the place of or in addition to the descriptors. The usefulness of faceted expression of subjects in retrieval can be enhanced in a computerized system as discussed in the following section.

SEARCHING AND USER'S INTERACTION WITH SYSTEM

14 As the discriminatory power among different subjects rests

with the Object of Study (Personality isolate) in Ranganathan's subject structure model, in searching for information in a database, it is advisable to start the search with the term(s) denoting this entity, if given. In the data format in a database, the leader/header/data directory for each record will register, among other things, the field tag and its attributes. If the search is started with the Object of Study term, which is relatively unique compared to other field values (e.g. attributes), the search will be faster and more economical. From the Syndromes database (see para 07) the combination of symptoms retrieves a few records. If the Object of Study (Personality facet) e.g. Heart is used as the first search term combined with the other attribute terms given, then a fewer number of records, only one record in fact, dealing with Tetralogy of Fallot, is retrieved.

15 Experience shows that user-intermediary-information system interaction or user-information system direct interaction helps in the more precise formulation of user's information need and in the searching process so as to improve the possibility of retrieving information/records pertinent to user's needs. Usually, terms representing concepts of interest to user are selected and combined using boolean and other operators to formulate search expressions. This process of facet analysis and synthesis should preferably match user's perception of reality/problem/information gap. Ranganathan's analytico-synthetic methodology formalises the process leading to a more or less consistent search formulation. Experience also indicates that a properly facet-analyzed query can give better retrieval performance (6). Vocabulary control tools, such as, thesaurus, subject heading list, classification

scheme etc., are usually used in processing queries.

16 In a paper on Patients' Records database (10), a thesaurus-like tool was created using terms derived from the records of the database to facilitate user interaction with the system in information retrieval. User is helped to start from broad divisions of patient's case history through the hierarchy of subdivisions. At the same time, where appropriate the user can also view related terms. An example is given in Annex 2.

17 User interaction and search formulation can be facilitated, made more productive by linking the facet-analyzed query terms to appropriate thesaurus terms so as to provide for browsing and a wider choice of concept terms. This can be done manually by looking up relevant terms in a thesaurus or by automatically using a computerized thesaurus and database of queries. A record for a query can have fields for the Statement of Query (by user), for Facet Analyzed Terms, for Name and Address of User, for Dates (receipt of and response to), for Notes on Response, etc. Example of an on-line worksheet is given in Annex 3.

18 When the query is displayed, each of the facet terms can be linked to corresponding terms in the thesaurus as shown in the example in Annex 4. In the example, the OECD Macrothesaurus (computer readable) was used and Micro CDS/ISIS software (Unesco) for preparing the Query database. As the OECD Macrothesaurus is multi lingual (English, French, Spanish), each query term can be linked to terms in the different languages. Search using terms from one language will automatically search with the corresponding terms in the other languages.

19 What has been demonstrated does not preclude direct search in the database using query terms or facet-analyzed terms; or search in the thesaurus to select appropriate search terms followed by search in the database. Free text search is also possible.

20 A database of queries, recording facet-analyzed search terms, will have other uses as well, e.g research on user needs, informetric analyses, updating thesaurus/classification scheme, search in the Query database first when a new query is received, preparing user profiles for SDI service, etc.

21 A similar facet analysis of the subject of a document (or information relating to an antity in a specialized database) can be done in inputting a record. The terms can be linked to corresponding terms in a thesaurus and displayed when the record is retrieved.

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ANNEX 1

FARM PRODUCTS: COMPARATIVE DATA

	Teak				Eucalyptus				Bamboo		
	1984	1985	1986	1987	1984	1985	1986	1987	1984	1985	1986
Palaghat	36	40	40	45	28	36	30	33	25	30	22
Trichur	26	46	42	35	38	45	32	23	27	29	32
Idukki	46	40	39	46	38	32	40	23	34	24	32
Trivandrum	43	45	23	35	38	23	51	42	35	32	21
Kottayam	45	40	40	32	38	36	29	42	35	30	21

ANNEX 2

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**********   ASSISTED SEARCH FACILITY   **********

                ========================

When you press any key, a screen will be displayed
and you will be asked to key-in a search term. Type
the term CASE, in lower or upper case. A list of the
areas into which a case history has been divided
will be displayed. Press <ENTER> key or the downward
arrow key as many times as necessary to move cursor
against the desired term e.g. SYMPTOMS. The press S
key to select the term. Divisions of and concepts
related to Symptoms will be displayed. As before
move the cursor to the desired terms and press S key
to select. Note options at the bottom of the screen
for formulating search queries.

                Press any key _
```

```
CASE

      CASE
_ SN  Patient Case History is divided into following searchable
      areas
_ NT  Administrative information
_ NT  Complaints
_ NT  Symptoms/ igns
_ NT  Interroga ion
_ NT  Investigation
_ NT  Pathology
_ NT  Treatment
_ NT  Postoperative
_ NT  Follow-up
_ NT  Recurrence
_ NT  Readmission

Y Next  [B]Back [F]irst [P]age [S]elect [T]erm select [M]ake file
add te[R]m(file)  [C]reate term  [A]dd relation  [D]elete
[Q]uery   sa[V]e  [?]display Query/save  search[/]add  e[X]it
```

INVESTIGATION
BT CASE
NT ANGIOGRAM
NT BLOOD
NT CARDIOVASCULAR SYSTEM
NT CT SCAN
NT HORMONES
NT MYEOLOGRAM
NT NMR
NT X-RAY
BT INVESTIGATION
NT X-RAY CHEST
NT X-RAY SPINE
NT X-RAY SKULL
BT X-RAY
NT ABNORMAL
NT SELLA GR.I
NT SELLA GR.II

CT SCAN
BT INVESTIGATION
NT COMPRESSED
NT DILATED VENTRICLE
NT HEAD
NT HIGH ATTENUATION
NT II VENTRICLE
NT III VENTRICLE
NT INTRASELLAR
NT PARASELLAR
NT SPINE
NT SUPRASELLER

ANNEX 3

WORKSHEET FOR QUERY STATEMENT

Query Statement _____

_____

_____

_____

Query in Facet Terms _____

_____

_____

_____

Name of User _____

Affiliation _____

_____

Address _____

_____

_____

_____

Date of Query _____

Date of Response _____

Remarks _____

_____

_____

_____

_____

ANNEX 4: EXAMPLE OF QUERY TERMS INTERFACED WITH THESAURUS

QUERY :Water resources planning and management in urban areas of Ethiopia
FACET TERMS: Regional planning>Urban planning>Ethiopia>Urban areas, Water:Planning.

THESAURUS TERMS

TERM: URBAN PLANNING
BT PLANNING
NT URBAN RENEWAL; ZONING
RT IFHP; LOCAL GOVERNMENT; LOCAL PLANNING; PHYSICAL PLANNING; TOWNS; URBAN DEVELOPMENT; URBAN PLANS; URBAN POLICY; URBANISM
TERM: ETHIOPIA
BT EAST AFRICA
RT ETHIOPIANS
TERM: WATER
BT RENEWABLE ENERGY SOURCES
RT HYDROLOGY; ICE; WATER CHEMISTRY; WATER CONSERVATION; WATER CONSUMPTION; WATER DISTRIBUTION; WATER LAW; WATER MANAGEMENT; WATER POLLUTANTS; WATER POLLUTION; WATER POWER; WATER QUALITY; WATER REQUIREMENTS; WATER RESOURCES; WATER STORAGE; WATER SUPPLY; WATER TREATMENT; WATER UTILIZATION
TERM: PLANNING
NT COMMUNICATION PLANNING; DEVELOPMENT PLANNING; ECONOMIC PLANNING; EDUCATIONAL PLANNING; ENVIRONMENTAL PLANNING; FOOD PLANNING; HEALTH PLANNING; HOUSING PLANNING; LOCAL PLANNING; NATIONAL PLANNING; PHYSICAL PLANNING; PROGRAMME PLANNING; REGIONAL PLANNING; RURAL PLANNING; SOCIAL PLANNING; TRANSPORT PLANNING; URBAN PLANNING
RT CARISPLAN; INFOPLAN; PLANNERS; PLANNING METHODS; PLANNING SYSTEMS
TERM: ETHIOPIA
BT EAST AFRICA
RT ETHIOPIANS
TERM: URBAN AREAS
BT HUMAN SETTLEMENTS
NT SUBURBAN AREAS; TOWNS
RT RURAL-URBAN MIGRATION; TURNAROUND MIGRATION; URBAN ATTRACTION; URBAN CONCENTRATION; URBAN LAND; URBAN POPULATION; URBAN SOCIOLOGY; URBAN-URBAN MIGRATION; URBANIZATION

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Classification and Indexing in India: a State-of-the-Art

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Guru Nanak Dev University
Amritsar, India

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Classification and indexing in India: a state-of-the-art.

-.-.-.-

M P Satija
Guru Nanak Dev University
Amritsar

1 Real beginning with Ranganathan.

1.1 Mechanism of the CC.

1.2 Naming Ranganathan's main contribution.

2 DRTC and Sarada Ranganathan Endowment contribution.

3 India's contribution to subject cataloguing.

3.1 POPSI and classaurus.

4 India's contribution to classification terminology.

5 Classification practices in India.

6 Classification teaching, research and literature.

6.1 Doctoral and other degrees research.

6.2 Literature

6.2.1 Textbooks.

7 Classification organisations, Conferences.

8 Epilogue.

1 Real beginning with Ranganathan

Modern classification methods had been introduced in India atleast a decade before coming of S.R. Ranganathan (1892-1972) to the scene. The real story of classification in India begins from 1924-1925 paradoxically on the English soil. Ranganathan in honour of whose birth centenary we have been conferred

this honour to host. this IFLA conference was then a student at the School of Librarianship, University College London. He was very much impressed by and intimate with his classification teacher W C B Sayers (1881-1960). While doing classification practice with the Dewey Decimal Classification, 11th edition (DDC-11; 1921), he was always puzzled as he could assign more than one correct class number to a given book. In most of the cases class number could take only one aspect of the knowledge contents of the document, and ignored many other subject aspects treated in the document. It was a case of a unidimensional classification trying to cope with the really multidimensional knowledge. His idea of a classification was that of translating faithfully the entire subject of the book into an artificial language of ordinal numbers called notation. Discerning the methodological inadequacies or the wrong approach of the DDC in listing all the possible subjects in the universe of knowledge, he hit the solution in a faceted approach. Ranganathan narrated later that the approach struck him while watching a demonstration of a meccano toy in a departmental store in London. His critics, even some friends, feel that the antecedents of facets lay crudely and unknowingly even in the first edition of the DDC(1876). In the Universal Decimal Classification(1905) this approach was further developed and used more consciously in the forms of auxiliaries. Ranganathan insisted that he invented the faceted approach without any knowledge of the UDC. Whatever be, there would be have been no faceted species of classification had the Colon classification

not been designed. The idea that he conceived was developed; the tentative schedules were applied for eight years on about 60 000 books before being published as Colon Classification by the Madras Library Association in 1933. The system was conceived intutively. The theory underlying the scheme was crystallised in his magnum opus and still a classic book, Prolegomena to library classification (Ist edition 1937; 2nd 1957; 3rd 1967). Apart from this Ranganathan wrote about half a dozen books, scores of reports and hundreds of papers exclusively on many aspects of classification. About 30% of total literature on and by Ranganathan pertains to classification alone[1]. Rightly or wrongly classification is considered his main forte. Many of his books including on classification have been reprinted[2]. Ranganathan has always been developing his classification and classification ideas[3], many a times too fast - that is one reason of less adoption of Colon classification by libraries. The 4th edition(1952) ushered a new version of the system breaking the rigidity of the facet formula. It brought in many rationalisations of the system in terms of the postulate of Five and only Five Fundamental categories and three planes of work namely Idea, Verbal and Noatational Planes. All this mechanism has been built into a dynamic and coherent theory of library classification described in terms of 55 canons, 22 principles, 13 postulates besides the all supreme Five normative principles called the 'Five Laws of library science' first published in 1931 in a book form under this title. All these principles

knit hierarchically with systematic expositions have gained the status of a general theory of classification.

1.1 Mechanism of the CC : The Colon classification is now in its 7th edition published in 1987. The CC is traditional up to the level of main classes, and canonical classes (i.e. traditional first array divisions of a main class). Thereafter it makes a clean break with the past. Each main class has been ultimately broken into indvisible concepts called Isolates. As per his postulate of Five Fundamental Categories each one ofthe isolate existing in the universe of knowledge essentially belongs to one and only one of the Five Fundamental Categories, namely Personality, Matter, Energy, Space and Time, known by the initionym PMEST. It cannot be denied that the concept of categories of knowledge goes back to Aristotle and later philosophers. It is only Ranganathan who postulated the least number of categories for any bibliographic classification. However, there is nothing absolute regarding the number of categories. It is simply a working hypothesis. A category in context of a given main class is further divisible in as many number of facets as the number of different characteristics applied to further subdivide a given category. A facet is a sub-group of isolates belonging to a category having a common characteristic. Facets within a category are arranged by the well defined Principles of Helpful Sequence. Isolates are arranged systematically into arrays and chains. The isolates can be assembled in the citation order of PMEST further helped by principles of facet sequence to construct virtually infinity of succinct

class numbers. The CC provides the necessary grammar in the form of rules exclusively meant for the CC. Thus this theory and technique provide tools for subject analysis of the document. Much beyond the arrangement of books on the library shelves. The CC has implications for subject cataloguing, thesaurus, thesaurofacet; infact as a tool for subject analysis and vocabulary control. It is too common to say that facet analysis has been accepted as basis of all methods of information retrieval. This assumption put forward by the Classification Research Group in 1955 has been corroborated by the results of the First International Conference on Classification Study and Research (Dorking:1957). It has now well stood the test of time.

1.2 Naming Ranganathan's Contribution: Apart from this Ranganathan's work can be summed as follows[4]:

a) He closely studied the anatomy of knowledge growth, and discovered the following modes of formation of new subjects:

1	By specialisation	2	By Interdisciplinary modes
1.1	Fission	2.1	Loose assemblage
1.2	Dissection	2.2	Fusion
1.3	Denudation	3	By Multidisciplinary modes
1.4	Lamination	3.1	Distillation
		3.2	Agglomerates
		3.3	Subject bundles

He postulated different basic subjects in the CC on the basis of such discoveries, and made his notation versatile enough to cope with the onslaught of new subjects. Jesse H Shera(1903-1982)

considers it as another fundamental contribution of Ranganathan towards the theory of library science[5].

b) Division of classification work in three planes namely Idea, Verbal and Notational. This allowed full freedom and space for the growth of work in each plane.

c) Formulated methodology for designing depth schedules.

d) Formulated eight steps (a programmed way) for learning and doing practical classification.

e) Invented emptying digits and sectorising digits for hospitality of notation in array and chain.

f) Put forth devices for sharpening or creating anew the new isolate numbers to construct class numbers for not yet enumerated concepts. On the basis of this methods he projected his classification as a self-perpetuating system; thus providing autonomy to the classifiers.

g) Gave and developed the concept of seminal mnemonics.

h) Postulated canons for fixation of standard terminology and for coining new terms; and compiled sources of terminology of Library and information science in general, and classification in particular.

His work on classification theory and methods is so systematic that Bernard I Palmer (1910-1979) claimed that Ranganathan has turned into a science what was usually a matter of flair[6].

2 DRTC and Sarada Ranganathan Endowment Contribution

Ranganathan's work has been furthered by the Documentation Research and Training Centre(DRTC) established in 1962 at Bangalore with Ranganathan as the founder head. In hearts of heart one aim

of Ranganathan, who was 70 at that time, was to train his successors, as Ranganathan was a firm believer in team and relay research for the growth of a profession. The foremost among the DRTC faculty and personally loyal to Ranganathan are (all Professors) A. Neelameghan, G. Bhattacharyya and M.A. Gopinath. As the name suggests it is an institute devoted to training manpower and to conduct research in broader areas of information work and services. The early work of the centre focussed so much on classification that it is little wonder that some librarians have taken it as a Centre for classification research. Its major work on Classification can be summed up as follows[7]:

a) Teaching and research on the methodology of designing of depth schedules for special subjects to classify microsubjects. The methodology has been summed up in a research monograph[8]. Formal teaching and research in designing and revising depth classification schedule goes on. More than 150 such depth schedules ranging from fountain pen technology to library cataloguing have been designed[9]. A few of them have been incorporated in the 7th edition of the CC.

b) Research on modes of formation of new subjects continues. This includes the system view of the Universe of knowledge, and their implications on the revision of classification schemes.

c) To develop typology and checklist of component ideas involved in the facet analysis.

d) Further research on classification has specifically centered on Colon classification released in 1987 under the editorship of M.A. Gopinath, Professor & Head of the DRTC. Its second volume devoted to index is still awaited. Published by the Sarada Ranganathan Endowment the CC-7 brings in many and far reaching changes that it is the most drastically revised edition since the 4th edition (1952). The changes consist in postulating many new basic subjects numbering about 700; discovering new varieties of common isolates. Ranganathan was of the firm opinion that all the myriads of special isolates under different main classes can be transformed (using the principles of seminal mnemonics) into a few common isolates. The CC-7 has put forward a small step in that direction. The CC-7 also recognises three varieties of the matter category. It has given some more substantial arguments to the non-believers in the postulate of Five Fundamental Categories. The CC-7 widened its notational base at the risk of getting unwieldy class numbers. Most of the reviews on the CC-7 have been critical strongly suggesting rectifications and drastic revision nothing short of the CC-7½.

Under an agreement with the Sarada Ranganathan Endowment, a leading book distributor UBS Publishers' Distributor(UBSPD), New Delhi during the last two years have reprinted and exclusively distributed most of Ranganathan's books especially on classification including the CC-6 (1963). Brisk sale of these reprints stand witness to the continued relevance of Ranganathan[10]. DRTC and the Endowment now plan to build a bibliographic database on Ranganathan,

and revise some of Ranganathan's books.

3 India's Contribution to Subject Cataloguing

To relieve the subject cataloguer from the tortuous hit and miss method of locating subject headings from a pre-fabricated list Ranganathan in his book, Theory of library catalogue (1938) introduced now very famous and ingenious method called chain indexing. It is a more or less a mechanical method for deriving subject headings from the class number; thus is equally applicable to all the languages. It is simple and economical. Its successful application in the British National Bibliography from 1950 to 1970 attested its value. Since then it has been used in many national bibliographies, current awareness services such as the British Technology Index. Even many classification systems such as BC-2 and the Russian BBK have used this technique for making indexes to the schedules. All the CC Classified libraries invariably use it to provide the alphabetical index to the classified part of the catalogue. As obvious from the BNB experience the chain indexing is equally applicable to all the classification systems which are hierarchical in nature. It is important to note that in libraries not using the CC in India the subject catalogues are either badly constructed or do not exist at all. Despite its inherent problems, it has stood the test of time for more than half a century. Further improvements in Chain indexing are afoot. It is heartening to note that research and progress in computerisation of Chain indexing was reported at the 5th Dorking held at Toronto in

June 1991[11]. By every account chain indexing is a contribution of the stature of facet analysis.

3.1 POPSI and Classaurus: To overcome some of the problems of the Chain indexing especially of entries out of context, in 1969 DRTC, especially G. Bhattacharyya, invented a Cyclic method of indexing named Postulate Based Permuted Subject Indexing (POPSI, popularly). The POPSI entries are all verbal divided into two parts called main part and complimentary to the main part. Every heading provides the full context of the document. It is based on the extensive comparative study of the structure of different subject indexing languages. Its postulates are based on Ranganathan's theory of classification. Bhattacharyya's considerable work centres on the deep structure of subject indexing languages (SILs) which provide the underlying principles for POPSI which is available in many versions. Complimentary to it is the classaurus which is a standard tool for vocabulary control. Classaurus is a faceted and hierarchical systematic classification incorporating all the necessary features of a thesaurus. As indicated by its name it emerges from the thesaurus and a (faceted) classification scheme. Though very slim in volume it can also serve as a thesaurus; for that reason it can be used with any indexing system. By assigning it notation it can be made to work as a classification scheme[12]. Its practical use is not reported. Indeed it lacks marketing efforts. Nevertheless many DRTC students have designed classauri for different subjects as student projects. Professor G. Bhattacharyya has

very recently retired and proposes to rewrite POPSI, Classaurus and the general theory of SILs[13].

4 India's Contribution to Classification terminology

From the very beginning, Ranganathan fully understood the need and importance of the availability and use of a standard terminology for the library and information science profession. To communicate his new thoughts, he amply coined new terms especially in classification. He was an apostle of standardisation. He did noteworthy work as the founder chairperson of the Documentation Section EC:2 of the Bureau of Indian Standards and a member of the ISO/TC 46. He created numerous standard sources of LIS terms published as separate ISI glossaries, and in the media of books and journal articles[14]. Herbert Coblans considers it as contribution to English language itself[15]. In wake of Ranganathan's work and appeals to fellow librarians about half a dozen Indian glossaries of LIS terms in English have been created in addition to many bilingual glossaries in English and Indian vernaculars[16].

5 Classification Practices in India

As a visible vacuum in our classification literature, there is no exclusive documentary or other source to infer the quantitative use of different classification systems in India. Nor it is easy to compile one for many different but obvious reasons. Different libraries use different classification systems; some use home-made substandard methods, and many still use non at all. Many

of the libraries are still beginning to classify their collections for the first time. Most of the newly opened libraries resort to Dewey. Expectedly the DDC, CC and the UDC are most popular general classification systems in India. Though no reliable data is available, nevertheless some indirect and fragmentary sources can be tapped to shed some clues to the extent of use of different systems. Some exercepts are cited below from a study made by this author in 1986 based on secondary sources[17]. From an all India library directory compiled by the Indian Library Association(1951) the use of different systems was inferred as follows: DDC 38.3%, CC 8.5%, UDC 2%, Brown's and Cutter's system 0.5%, Other methods 37%; and 13.5 % libraries did not answer this question. Another small directory compiled by the Indian Association of Special Libraries and Information Centres (Iaslic, 1962) indicated the use of different systems as follows: DDC 43.9%, UDC 20.2%, CC 13.3%, Other systems 1.8%, Selfmade system 10.4%; and the remaining 10.4% libraries did not respond. It clearly shows that in special libraries the use of the UDC is considerable. Another important source is the Ph.D. dissertation of Mrs. P.Dhyani who made a sample survey of Classification practices in Indian libraries with special reference to Delhi and Rajasthan. Her thesis in the revised published form presents the following picture in respect of 339 libraries[18].

DDC	175 (51.6 %)	LC	02 (0.6%)
CC	81 (23.9%)	Special schemes	15 (4.4%)
UDC	51 (15.0%)	No scheme used	15 (4.4%)

Total: 339 (99.9%)

Since the sample is hetrogenous and small so cannot be taken as any true indication of the extent of use of different systems. It provides a rough estimate of the comparative popularity of different systems.

Despite the CC projected as India's national classification system the DDC is the most widely used system in all types of libraries in all parts of India. India's national library at Calcutta and more than 80% of the 180 University libraries using the DDC are no exception. Not only this, India is the largest user of the DDC in the orient[19]. The Indian National Bibliography (INB)(1955 +) modelled on the BNB is classified by the DDC, though every entry also additionally provides the Colon class number to help libraries using the CC. The annual Indian Books in Print (1970 -) also uses the DDC to arrange its subject part. The DDC was introduced in 1915 by a famous American librarian Asa Don Dickinson (1876-1960). To cope with its WASPish bias most of the research libraries have adapted and extended it. There is hardly any big library in India which has not modified it. History of such adaptations is long and interesting and is a lesson on the socio-cultural bearings of any Classification system[20].

6 Classification: Teaching, Research and Literature

Under the still overwhelming influence of Ranganathan, the theory and practice of library classification constitute an essential and weighty component of library science curricula in

all the 100 library science schools in India. It is about 25% of the total curricula at the B.Lib.I.Sc. level. All the 50 library schools offering M.Lib.I.Sc. place emphasis varying from 25% to 5% of the total curricula contents depending upon the extent of their modernisation. The national average of classification content in M.Lib.I.Sc. curricula can be placed at 10%. As [illegible], if by an unstated law, the schools laying much emphasis on information science and technology give less weightage to Classification studies. Classification studies have remained firm and steadfast in India even when they suffered a setback in the West in early 1980's with the coming of OPACs. In theory, it is Ranganathan's theory of classification which dominates the syllabi with a marginal touch of historical or comparative studies. Classification curricula of any library schools reads like a synopsis of Ranganathan's work. In classification practical, the CC and DDC are taught at the B.Lib.I.Sc. and CC and UDC are taught at M.Lib.I.Sc. level.

6.1 Doctoral and other Degrees Research: Consequence of its intensive teaching the classification problems are not less popular with researchers. It is no mere coincidence that the first two doctoral degrees in library science were awarded on Classification problems[21]. Doctoral research work done in classification mostly by DRTC senior faculty members under the guidance of M R Kumbhar at the Karnatak University, Dharward is interesting and valuable:

1) A general theory of subject indexing language by G. Bhattacharyya.

2) Criteria for recognition of Fundamental categories by M.A. Gopinath.

3) Development of terminology in the field of library classification by K.N. Prasad.

4) A matrix for compatibility of schemes for Classification by S. Seetharama.

5) A computer based software for generating subject indexes by F.J. Devadason[22].

Yet Kumbhar had had no influence on the Classification work of the DRTC. The other topics of research in the area are POPSI by D. Chandran(1985) Analytico-Synthetic Classification by R. Vohra(1984) Classification practice by P.Dhyani(1981) and Common isolates by A.Y. Asundi(1982)[23]. In a bibliographical study of LIS dissertations in India from 1957 to 1985 it was revealed that out of the total 44 Ph.Ds 8 (18%) were on Classification alone - which is the highest percentage for any single area. Similarly, the per centage of M.Lib.I. Sc. dissertations is 6.6%[24].

6.2 Literature: Classification literature forms a sizeable chunk of the total LIS literature in India. In a bibliography of the total of 2957 entries from 1970 to 1990, 617(21%) pertain to Classification alone[25]. Most of the literature on classification is on and by Ranganathan, with other systems taking a back seat. Most of the post-Ranganathan literature is descriptive, repetetive and uninnovative. Though, all the Indian library science journals welcome articles on Classification the Herald of Library Science (1962 +) and Library Science with a Slant to Documentation (1964 +) are the core journals for this purpose[26].

6.2.1 Textbooks: In textbooks too Ranganathan ruled the roost. To elucidate or simplify him some textbooks on classification especially in theory have been written. With the passage of time, some other areas such as comparative studies, general theory of Classification, book numbers, and some monographs on the CC, DDC and UDC number building have been written. Inevitably the CC with about a dozen books on its practical aspects is most favourite of the Indian authors, though many librarians and students at large continue to complain of its complexity. Apart from Ranganathan, whose boo.s belong to the richest writings on our science many Indian authors have written extensively on Classification. The foremost names include P.N. Kaula, Krishan Kumar, A.A.N. Raju, P.S.G. Kumar, P.Dhyani and M.P. Satija[27]. Krishan Kumar is a household name for his book on the theory of Classification. This book in a very simple and plain language covers the Classification syllabi at all levels of all the Indian universities. It is a handbook on the theory of classification[28]. Quantity is impressive though apart from Ranganathan, all the Indian books on Classification are pedestarian.

7 Classification organisations, Conferences

Ranganathan had an immense faith in collective work: he was an ardent exponent of team and relay research. He used to say that the days of solo research are over. He inspired and helped the establishment of library associations in India. Being

a crusader it was incumbent upon him to train and take along people to spread his message and to create a library awakening, and above all to do team research. In the early 1950's a Delhi based Library Research Circle functioned effectively under the chairmanship of Ranganathan. It was CRG's counterpart with which it always exchanged notes. This group of volunteers did considerable work published in the pages of the ILA organ ABGila (1949-1953), or in the annual ILA conferences. It is a glorious chapter of history now[29]. Library science study circles have existed here and there but non worth mentioning on classification. The various library associations have subject interest groups(SIGs), but they exist in papers. The Indian Association of Teachers of Library and Information Science(IATLIS) formed in early 1980's the Classification Society of India as its organ with P.N. Kaula its President and M.A. Gopinath its Secretary. Further to one or two inconsequential meetings and two irregular issues of its bulletin it has remained defunct. Indian chapter of the International Society for Knowledge Organisation(ISKO) has more than 30 members which is about 10% of the total ISKO membership from about 40 countries. Two Indians namely Krishan Kumar and Gopinath are members of its Scientific Advisory Board. India was well represented at the first and highly successful ISKO Conference held in Germany in August, 1990. ISKO has reposed its confidence and trust in the Classification profession in India by agreeing to hold its 2nd Conference concluded last week (August 26-28, 1992) at Madras.

Ranganathan helped the foundation of FID/CA in 1951 (now FID/CR) and served it with distinction, and made its foundations strong and deep. Again from 1973 to 1980, the FID/CR Secretriate was shifted to India with A Neelameghan its chairman. In addition to issuing various regular reports on research in classification it started a regular FID/CR Newsletter, which is still published regularly in the columns of the International Classification. In 1975, the 3rd Dorking was successfully held in Bombay on global ordering systems[30]. At the International Conference on Ranganathan's philosophy held in New Delhi in 1985 the largest session was on classification[31]. On that occasion the FID/CR availed of the opportunity to hold its second regional conference on Classification and Communication[32]. Indian librarians have actively participated in international conferences on classification and related areas. However, since long the classification research and problems are not forming topics of Indian library conferenceers. There is all quiet on this front now.

8 Epilogue

We need to examine and emphasise the role of classification in Indian databases and national bibliographic networks such as UGC's INFLIBNET. Let us ensure that the National Information System in Science and Technology(NISSAT) program accords due attention to classification use and research. We are the proud inheritor of a glorious legacy bequeathed to us by Ranganathan; we are conscious of our obligations and challenges to perpetuate it; and keep India still a bastion of Classification studies and research that it once was - not long ago.

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8 Gopinath, M.A.: Construction of depth version of Colon classification: a manual. New Delhi: Wiley Eastern, 1986. viii,163p. ISBN-085 2263260.

9 These have been published mostly in the journal Library Science with a Slant to Documentation (1964+) initially co-sponsored by the DRTC and the Sarada Ranganathan Endowment for Library Science (established in 1961). Mrs Sarada (1908-1985) was Ranganathan's wife; Endowment is now the legal heir of Ranganathan's material and intellectual property. Obviously, it has the legal responsibility to perpetuate Ranganathan's thoughts and sponsor research in areas clear to Ranganathan. Now the Endowment is the sole sponsorer of this journal. It is no mere coincidence that the very first paper in the inaugural issue of this journal was on designing depth schedules by Ranganathan himself.

10 See ref. no.2

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12 Bhattacharyya, G.: "Some significant results of current classification research in India". Int.Forum.Inf.Doc. 6(1) 1981: 11-18.

13 Bhattacharyya's letter No. DRTC/1530, dated December, 18, 1991 to this author.

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21 Satija, M.P. "Sources of Indian library and information Science dissertation". Libri 39(1) March 1989: 73.

The first Ph.D. was awarded to D B Krishna Rao by the University of Delhi who worked under the supervision of Ranganathan to prepare a depth schedule of Agriculture.

The second Ph.D. was awarded in 1977 by the Panjab University to P S K Sharma who drafted a modified schedule of the DDC-18 to classify Indological subjects. The University of Delhi was first to institute Ph.D. in library science in whole of the British Commonwealth.

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23 The full details sans abstracts are available in the bibliography by P S G Kumar, see ref. number 24, pages 287-289.

24 Kumar, P.S.G., Comp: Research in library and information science in India: A bibliography of Ph.D., M.Phil and M.L.I.S. dissertations. New Delhi: Concept, 1987, Concept, 1987, pp.xii-xv.

25 Gupta, B.M., ed. Libraries, archives and information technology: an annotated bibliography. New Delhi: Aditya Prakashan, 1991. pp.130-222 (Handbook of libraries, Archives and information centres in India; vol.11).

26 The complete list enumerating more than 100 items of Indian library science journals and newsletters has been given as appendix 2 (pp.438-442) of B M Gupta's bibliography, cited at reference no.25.

27 For full bibliographical details of these books consult B M Gupta's bibliography which provides both the author and subject approaches.

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This book was first published in 1979 and since then has been issued many times with minor changes. for its book review read : Int.Classif. 18(3) Sept,1991:170-171.

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31 Girja Kumar and Krishan Kumar: "International conference on Ranganathan's philosophy". Int.Forum.Inf.& Doc. 12(2) April 1987:24-32.

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IFLA GENERAL CONFERENCE NEW DELHI 1992

Division: Bibliographic Control

Section/RT: Classification and Indexing

24-CLASS-3-E

Joint Meeting with:

WORKSHOP THEME (IF APPLICABLE):

Guidelines for Subject Authority and Reference Entries (GSARE)
A first step to a worldwide accepted standard

Werner Stephan

Die Deutsche Bibliothek

Frankfurt am Main, Germany

For internal use only:

Meeting No: 109

SI: yes/no

Estimated number of participants in the meeting:

Abstract

Guidelines for Subject Authority and Reference Entries

During the last five years guidelines had been worked out for Subject Authority Entries and its references with the support of the IFLA-section "Classification and Indexing".
1987 a working group started with the aim to work out guidelines for subject authority files. But during the work the objectives changed a little bit and as the result now guidelines are presented, which might become a basic standard. It is intented to see these rules as an addition to Gare and we hope the guidelines will be a document which is helpfull for all types of verbal subject indexing.

Guidelines for Subject Authority and Reference Entries (GSARE)
A first step to a worldwide accepted standard

Werner Stephan

During the last five years guidelines had been worked out for Subject Authority Entries and its references with the support of the section "Classification and Indexing", a part of the IFLA-Division "Bibliographic Control".
1987 a working group had been set up in the section, which wanted to work out guidelines for Subject Authority Files first. The members of the working group were recruited out of the leading libraries worldwide.
Special attention was paid to all activities of possible exchange in the field of information flow. So additionally the knowledge and help of the libraries of the working group members was very important.
Under the leadership of Ms. Barbara Kelm, section secretary 1986 - 1990, the working group wanted to widen the IFLA / UBC publication "Guidelines for Authority and Reference Entries (GARE)". For this reason the idea was to work out rules for topical headings (which were explicitely excluded in GARE 1984) and to add them to the publication.
Therefore a working programm similar to the structure of GARE was planned:

1) To work out rules for subject entries as well as for its relations in authority files (structur of reference).
2) To check whether the standarized UNIMARC format is suitable for subject authority file records.
3) To considerate possible relations between subject headings and classification reccords.

and

4) To publish the worked out guidelines and to show fields for further research in this area.

There shouldn't be a severe discussion about it, but sometimes we have to ask "What is subject indexing?" and "For which purpose is it?".
It is amazing, and at the same time characteristic, that you will not find any answer to this question in standard textbooks and only a few in latest publications. It seems as if we have lost the main purpose of librarians work out of view while discussing rules and codes: We have to give users a most effective subject access to library holdings.
It is a fact that with quite comfortable catalogues the possibility of subject research will be used more intensively.

Normally librarians are in the lucky position that they will find a book, a document in their library for sure if they only have an acceptable bibliographic description given. This experience, this sureness to be able to fullfill one of their basic tasks had fed the expectation of the librarians, they

could find a document with the same certainty and perfection under subject viewpoints. Of course on condition that the used systems of subject indexing are nearly as perfect as the systems of bibliographical indexing and that people who use such systems of subject indexing will do this accurately.
As an result of installing automatically supported retrieval methods for document search the subject search with index terms and their combinations through Boolean operators get more and more importance against the search with wide concepts.
Therefore especially in international viewpoints it is important to define common rules. They will help the librarians to reach greatest possible conformity in the construction of subject headings.
With nowadays data processing it is possible to create catalogues of libraries in different formats, to put them together or to extract parts of them. So we have to ask, which catalogues should be built up on which level of our todays structure, and which ones should be accessable for users and libraries.

Some years ago catalogues were built up under the restriction of local possibilities. Today data processing theoretically enables us to store every amount of datas and to have them accessable from various places at the same time. This means organizational restrictions (card catalogue) as well as locality restrictions are not longer existing.
Theoretically we could work with a local union catalog as well as with an european or a worldwide one. Nevertheless, there is

one requirement for it: Data formats and its codes have to be compatible. Therefore it is importatnt to give standards which local agencies can use. Even if this standards are only a compromise of already existing rules.
Standards have had an important role in any librarian project. That doesn't only mean to follow rules and to describe data records most exactly, but the acceptance of some standards and the behaviour towards the librarian public in general are most important for the success of a planned cooperation.
There are mainly two kinds of standards: Worldwide established standards, which are more or less following international rules, and other ones, which are accepted only national or even local.
Out of international point of libraries view there are to mention mainly the "Guidelines for authority and reference entries (GARE)", ISBD and the most important exchange format UNIMARC. So we hope that the now given rules will play the same role for indexing and the use of subject headings as GARE did.

Much time had been spent to describe the meaning of special terms in different languages. For example the meaning of the term "Schlagwort" in the german code (RSWK) is quite different to the meaning of "Subject Heading", which is used in the code of the Library of Congress. This was one of the reasons to widen the title to "Subject Authority Entries" instead of a limitation to records o "Subject Authority Files". As well, the working group had more the intention to show concepts rather than to describe single terms.

The structure of the rules is mostly similar to GARE, but some points had to be created and newly defined because of the special demand of subject catalogues and subject authority files.
So the discussion about definitions needed to be a main part of the work. New definitions had been created and deleted, texts had to be changed and harmonized with other chapters.

Per example heading	now	Descriptor	see	Subject
	prior	Descriptor	see	Preferred term
	now	Entry, A record contained in register		
...				
	prior	(no definition)		

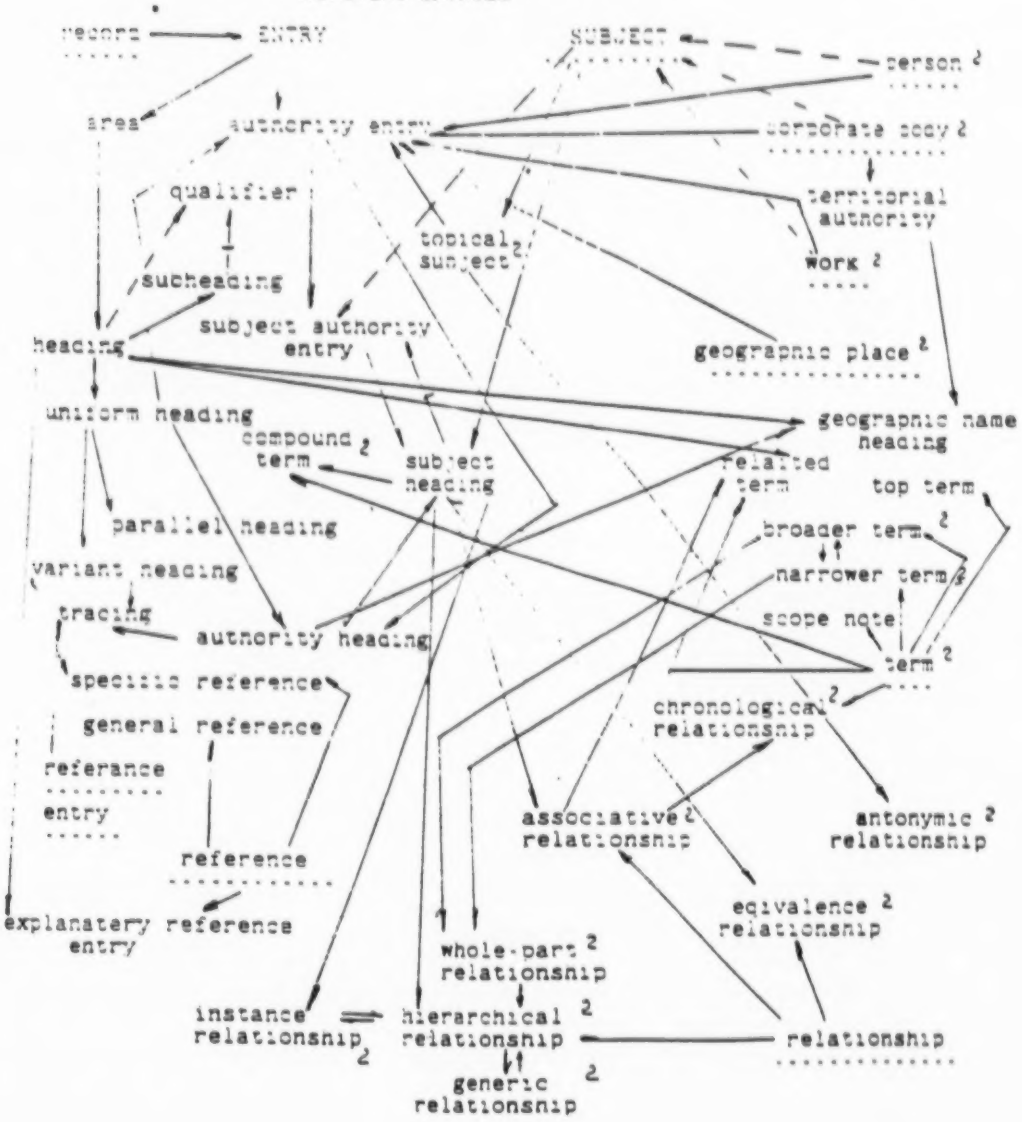
We could go on with examples like this for a long time, the list of outtaken or changed definitions are even longer than the list now given in the rules, and its the same for the rest of the text and the examples.
Nevertheless, it seems that the work done by the group was justified. Most of the comments we got until today (15.05.92) explicitely thank for publishing of the new standard.
Especially they welcomed the simple and logical use of the principles and the easy understanding of the texts.
Surely there are a few hints or wishes to change parts of the text, e.g. to reduce the number of examples or to change parts of definitions. In some cases additional discussions of the

working group will be necessary, but in the end there will not be essential changes of the rules.

The following chart (which I got with one of the comments) will show you the complexity of the relations of the terms (definitions).

Figure 1

THE STRUCTURE OF RELATIONS BETWEEN TERMS IN GUIDELINES FOR SUBJECT AUTHORITY AND REFERENCE ENTRIES



From the above mentioned working program point 2 and 3 were taken out or were only partly discussed. The working group means the guidelines as an universal document for all types of verbal subject access. Special questions should be discussed in special working groups, for example there will be further discussions in a working group which is spezialized on the choice of subject headings or chains of index terms.
Without the effort of the section for Classification and Indexing and its working groups the international library scene would pay less attention to problems of subject access.
Therefore I want to thank all members for their work in the group. The hard but objective discussions will be useful for all of us, and we hope, that the now shown rules will be widespreaded.

IFLA GENERAL CONFERENCE NEW DELHI 1992

Division: Bibliographic Control

Section/RT: Cataloguing

Joint Meeting with:

WORKSHOP THEME (IF APPLICABLE):

9-CAT-1-E

Training Non-Cataloguers about Cataloguing

by

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Training Non-Cataloguers About Cataloguing

by

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ABSTRACT

The forms of library catalogues have changed with the use of technology in libraries. These changes in library catalogues have made it more important than ever that public services staff understand cataloguing practices.

TRAINING NON-CATALOGUERS ABOUT CATALOGUING

The card catalogue in dictionary form has been replaced or supplemented in a number of libraries by new forms of catalogues that are computerized and can be displayed on a screen or printed as needed. Providing a catalogue and an authoritative record of holdings is one of the important roles that libraries have played and will need to continue to play as technology changes. Although the purpose of cataloguing has not been essentially changed by advancements in technology and standardization, the methods of constructing catalogues and presenting them to the public are different. Such changes will probably continue as the capability for mass storage of data increases with the use of devices such as the optical disk.

These changes in library catalogues have made it more important than ever to be certain public services staff understand cataloguing practices. The public services staff need not only to assist catalogue users but should also be involved in shaping catalogues that will serve the needs of users in the electronic environment.

LIBRARY ENVIRONMENTS

The environments of libraries have changed as the resources and technologies available and the needs and characteristics of the people they serve have changed. Since the direction of change in libraries is generally from the simpler to the more complex, more staff expertise is needed. In the current library environment

there needs to be more than dependence on work experience and increasing reliance on training. Training is needed to teach job skills, to upgrade skills, and to evaluate current library practices to see if they should be replaced with new ones. Training of non-cataloguers about cataloguing is a necessary response to change in the catalogue. Like other organizations, libraries are becoming more dependent on skilled employees and on the education and training through which these employees acquire skills. Success in automated libraries depends on teaching people what their work requires them to know.

The catalogue is the library's most valuable reference tool and without it the expenses of collection development and public services staff are not efficiently utilized. The capabilities of today's automated catalogues enable librarians to carry out activities in a variety of locations and can make the historical division of labor between cataloguers and reference librarians less necessary. Even when cataloguers create the bibliographic records the distribution of terminals throughout the library provides various staff with the potential means to enhance, amend, and delete records. While online catalogues are deceptively easy for the novice to use, they are definitely not yet self-service tools. Reference librarians and other staff will need help deciphering online records and retrieving materials for their own use and to assist users.

Most library staff and many library users are now comfortable with computers. That comfort and knowledge provides flexibility in staff assignments and in training activities. Some believe that it

is too costly to extend the expertise of technical services departments to public services librarians. Most agree however that improvements in and enhancements to online catalogues are needed to better meet the needs of users. Because they hear what users are saying, public services librarians should be involved in the design, implementation, and improvement of online catalogues. Public services librarians need to work with technical services librarians and systems designers since all three groups have skills essential to the creation of the catalogue. To work with technical services librarians and systems designers, public services librarians must be well educated about the online catalogue.

PUBLIC SERVICES STAFF

Research and development in the 1980s focused on ways in which online catalogues could be more responsive than their earlier counterparts to the needs of library users. Yet in the March 1992 issue of Information Technology and Libraries a discussion of catalogue user interface design states that service-oriented librarians combined with a mediocre online catalogue will provide better real user service than a first-rate catalogue with no librarians in sight. If libraries accept this statement and follow this approach this means that training public services librarians about cataloguing is vital.

Once public services staff have a thorough understanding of the way the catalogue functions, they should also take part in identifying problems and correcting these problems to improve the catalogue. Public services staff, due to their high level of

catalogue use and interaction with the public, are often the staff who hear about users problems with the catalogue. They need to be well informed to help users solve problems and to accurately report problems needing cataloguing attention to the cataloguing staff.

Public services librarians and cataloguers must work in collaboration to ensure that the best possible online catalogues are developed. Librarians with cataloguing responsibilities should be involved in the collection development and service programs of the library to be aware of user needs. Public services librarians need to be trained about cataloguing to meet user needs. Some authors propose the integration of public and technical functions but unless this happens public service librarians will need to be trained about cataloguing to provide the best service to library users.

In many graduate library school programs cataloguing is no longer a required part of the academic program. Often, it is only after someone begins work in public services that they realize how much they need to know about cataloguing. Sometimes public services librarians do not know enough to realize how much they do not know. It then becomes the responsibility of the library to help these non-cataloguers learn about cataloguing. Cataloguers need to work closely enough with public services librarians to be aware of what they may not realize they need to know.

CATALOGUE ISSUES

All library staff, not just those in the cataloguing department, need a basic knowledge of cataloguing. The ability to

identify a publication and to determine its main entry is essential. In public services the staff must know how to use the catalogue, be able to show the patron how to use the catalogue, and know the kinds of information that can and cannot be found in the catalogue. This requires a basic knowledge of descriptive cataloguing and of the rules for main entries, filing rules, subject heading construction, and of the classification scheme.

The online catalogue can be used remotely by those not present in the library and often provides access to various in-process files not previously available to the library users. Catalogue maintenance becomes a public issue as all library staff and library users have access to files previously not widely available. With proper information and training, various staff can help with maintenance issues by identifying what needs to be changed or improved. The online catalogue can be a focus for change in the library as more information is available to be used in a wide range of settings and staff with various experiences and backgrounds work together.

With online catalogues it is important that libraries respond to the expressed and unexpressed needs of users. Often assistance is not requested and users make assumptions that may not be valid and do not locate needed information. We know from research studies that the preferred method of learning is trial and error, followed by online help. When users do a subject search, they are almost as likely to fail as to succeed in retrieving even a single relevant hit. We also know that most users change their intentions as they progress through information seeking tasks. Most users do

not want to spend time learning how to use the catalogue - they just want to locate the information they need quickly and easily. Users are not always seeking to perform optimally. As access becomes a bigger issue and collections grow at a less rapid rate, the catalogue as a bibliographic surrogate is even more important for library users. Thus having a well presented and comprehensible catalogue is even more essential.

Catalogues that provide transaction logs offer opportunities to learn about what public services librarians and users may not know. Cataloguers may want to spend time observing how public services staff use the catalogue and how they respond to user requests. When one works with the catalogue in the intense way that cataloguers do they may not realize how different some aspects are to non-cataloguers.

TRAINING IN THE ONLINE ENVIRONMENT

In the online environment with new work patterns and library units dependent upon one another, quality training will be critical. New techniques and approaches will be required and it may often be most effective to do centralized training in the online environment. As library functions are automated training materials will need to be developed, staff may need to be trained as trainers, and time will need to be allocated for staff to learn. Librarians will need to learn how to handle the disruptions that can occur in an online environment. Training and retraining will have to occur frequently as changes in online systems are implemented. Staff will need to see the broad picture and

understand the relationship of various library tasks. In an online environment more training will be needed and training will need to be continuous.

With these challenges many libraries will find it necessary to develop some training for public services librarians (and other non-cataloguers) on cataloguing issues. These staff need to know the standards that are used in creating the catalogue and be able to explain them to users. Training should be ongoing since automated systems users reach learning plateaus and need continuing encouragement to expand their knowledge and understanding. This is especially true with catalogues that have staff and public catalogue functions that are distinct. The public services staff will quickly forget the staff side of the online system if they do not use it often.

The first step in planning training is to identify job changes or problems that may require training and to assess the extent of the skills problems that could be encountered and consider options for addressing them. Involvement of those to be trained as partners during the planning process is essential. Staff to be targeted for training should be identified early in the process.

Carefully planning training sessions is essential and there are several prerequisites to a successful training session. The expected outcomes must be articulated. The trainee must see the need for the expected change and believe the session will be a beneficial step toward change. Follow-up should be planned for the training sessions.

Technology adaptation occurs in stages. Technology makes new

and different approaches possible and ultimately transforms behaviors. Training can help to bring about this transformation. There may be a need to recognize various learning styles and varying levels of adaptation to technology. Library administrators need to be certain that training is a routine part of library activities and that time is allocated on a regular basis for training. Each library must take responsibility to be certain that appropriate training is available whether within the library or through other means.

PROFESSIONAL ORGANIZATIONS AND PUBLICATIONS

Library organizations and library publications directed toward public services librarians can also be important venues for education about cataloguing issues. As library literature becomes more specialized and voluminous it becomes less likely that public services librarians will read publications directed to cataloguers. Cataloguers should direct some of their effort in writing for journals read by public services librarians. Offering workshops in collaboration with organizations of public services librarians could also be prove effective. As librarianship and the work performed in various specialties become more focused, training and publishing efforts must be directed toward nonspecialists.

Rather than each library developing its own training sessions, it may be more efficient and effective to focus general cataloguing training efforts on what can be provided by professional organizations and publications. However, each library will need to provide training specific to its catalogue and environment. On-

the-job training cannot be effectively replaced by other types of education or training and each library should plan for appropriate internal and external training activities in its budgeting and allocation of staff resources.

CONCLUSION

The online catalogue provides opportunities for changes in libraries and the services we provide to library users. Cataloguers need to take an aggressive role in being certain that public services librarians get the training they need to help catalogue users make the best use of this valuable tool. Effective training increases efficiency, effectiveness, and productivity for public services librarians. By working with public services librarians, cataloguers may also get some ideas on how to make the online catalog more responsive to user needs and expectations.

While the ultimate goal should be to develop a catalogue that can be used by public service librarians and library users without training, until such a point is reached training of public services librarians will be essential. Without such training public services librarians cannot help to develop a catalogue that will be more responsive to the needs of library users.

The online catalogue provides an impetus and opportunity to better meet user needs. Dialogues and partnerships are required to create the catalogues that will more effectively meet user expectations. The challenge for cataloguers and public services librarians is to work cooperatively to use technology to continue developing catalogues that respond to user needs.

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Educating Users About Catalogues and Cataloguing: The Impossible Dream

by

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Educating Users About Catalogues and Cataloguing: The Impossible Dream

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ABSTRACT

Catalogue use studies in manual and online environments over the last fifty years have been successful in identifying user behavior and causes of user failure, but they have not led to substantial change in catalogue codes or practices. The online environment offers a myriad of new challenges.

EDUCATING USERS ABOUT CATALOGUES AND CATALOUGING: THE IMPOSSIBLE DREAM

You are not the first librarians to ask questions about users' interactions with library catalogues. In fact, there is a sizeable body of library literature which explores this interaction from various perspectives. Questions which have been asked range from "How do patrons use a library catalogue?" to "What do users need to know about library catalogues?" These variations reflect the bias of the questioner; the first was asked by the cataloguers who were interested in improving the catalogue for the user; the other was asked by user education librarians who were designing handouts, lectures or computer-assisted aids which explain how to use the catalogue.

The American literature of users and catalogues was sparked by William M. Randall in a speech to the catalogue section of the American Library Association in 1931. He challenged the attendees to improve the catalogues, not by studying the catalogues or the rules, but through "an intelligent study of the patrons themselves; their mental equipment, their background, and their needs."[1] Shortly thereafter, a catalogue use study was conducted which focused on how patrons used library catalogues. The number of such studies increased steadily from the 1930s to the 1970s. In his review article, "Catalog Use Studies and Their Implications," James Krikelas identifies fifty-four catalogue use studies conducted in the United States.[2] They include all types of libraries and categories of users. However, a subtle shift in focus occurred in the studies conducted after 1960. While earlier studies analyzed the interaction of the user and the catalogue with the objective of improving the catalogue, later studies analyzed the user/catalogue interaction with the objective of designing an automated catalogue.[3] A resurgence of catalogue use studies occurred in the 1980s. Researchers continued to study the interaction of users with library catalogues, but the catalogues were automated catalogues, and the methodologies used were tailored to the new technology. (It was as if card catalogues had disappeared from all libraries and were miraculously replaced by online catalogues!) The focus of the studies also shifted from

emphasis on the elements of the catalogue record and interpretation of catalogue codes to the problems inherent in searching in an online environment.

User education in the United States began in the 1930s, but the vast quantity of library literature about user education dates from the mid 1970s. While user education librarians studied and learned from the catalogue use data, their interest was not in how to change the catalogue in order to facilitate use, but in how to help the user understand the catalogue that existed. Therefore, the literature varies from very practical advice on what catalogue elements to teach in a one hour lecture to conceptual approaches for instruction about the card catalogue. However, the user education community was blossoming at the cusp of change. Automated catalogues were close at hand; the shift to users interacting with catalogues in an online environment became a fact in the early 1980s. Since that time, the literature of user-education has been dominated by studies of users and online catalogues.

What Have We Learned about Manual Card Catalogues?

What does the literature of catalogue use tell us? Krikelas summarized the findings in the catalogue use studies conducted before 1970:

> (1) . . .Students comprise the largest single group of catalog users.
> (2) The approaches taken to searching a card catalog vary and are related to the patron's educational status: the frequency of known-item (as opposed to subject) searches increases as the educational level of the patron increases.
> (3) The majority of catalog inquiries are made to identify English language material, of relatively recent date, in order to complete classroom assignments.
> (4) The most frequently used information on catalog cards is author, title, subject headings, call number, and date of publication.
> (5) Between 70 and 80 percent of all searchers are successful to the extent that a user is able to identify some relevant document; of the failures, 5 to 10 percent are attributable to the fact that the document is not in the library's collection.[4]

While these generalized findings do not help the questioner whose purpose is to improve the card catalogue, they do have implications for user education librarians. Statements 1 and 2 focus on the user. They harken back to William Randall's speech of 1931 when he urged the

study of patrons, their mental equipment, their background and their needs. Statement 1 tells us that most users are students. While that is not terribly enlightening for the librarian in a college or university setting, it is a somewhat surprising finding for a public library. In both settings, the user education librarian can anticipate that the typical user is a student gathering material for a class assignment. Statement 2 provides some guidance as to what that typical student "brings" to the library.

Known-item searching increases with the educational level of the patron. Why? Faculty or graduate students gather information from colleagues, from conferences, or from reading/browsing in the literature. They use their established networks to gather citations. Students do not have personal networks. Having neither a network nor in depth knowledge of a discipline, their approach to the card catalogue must be a subject approach. It follows that need for instruction in the subject approach to a card catalogue becomes very important to the design of user education materials for the typical user—the student.

Statement 4 is central to the cataloguer's question, "What elements in a catalogue record are useful?" and to the user education librarian's question, "What elements in a card catalogue should be included in instruction?" However, the most frequent use of those five elements does not exclude the need for other information to be present on the card. And, explaining those five elements in a written handout or a one-hour lecture is still a formidable task. It is only when statements 4 and 5 are linked that observations and conclusions can be drawn by both cataloguers and user education librarians. How does the user behave when a search fails? What causes failure? What can be improved in cataloguing codes or principles, or taught in user instruction in order to help the user achieve success?

The studies of card catalogue use indicate that success in a known-item search is directly related to the amount of and accuracy of the information held by the user. For an author search,

the more accurate the information the more likely that success was achieved. That is, if the user had in hand a first and last name, correctly spelled, and a middle initial, then the success rate was very high. However, the relationship was not so evident between amount and accuracy of information and success rate of title searches.[5] Catalogue use studies also tell us that "when the users possessed information about the author and the title, the majority preferred to look first under the author. Second tries were almost equally divided between title, author, and subject approaches. The third trial is marked by a sharp increase in searches by subject."[6] These observations suggest that when failure occurs, more information on the catalogue card is utilized in succeeding attempts.

What causes failure? Krikelas lists six difficulties that were identified by various studies:

> (1) filing rules used in catalogs; (2) subject headings—the absence of certain terms or the use of terms too general for the user's needs; (3) the "see" and "see also" structure; (4) the lack of title added entries; (5) inaccurate bibliographic information possessed by the patrons; and (6) call numbers.[7]

Several of those points of failure relate directly to the codes and principles of catalogues: filing rules; subject headings; cross references; completeness of entry; and call numbers. But the only statement that readily suggested an area for improvement for the cataloguers was the lack of title-added entries. In response to these findings, title-added entries were more often included in a card catalogue.

These findings are more useful for user education librarians. The need for instruction in subject searching already has been identified by data relating to the typical user; the data on failure rate reinforces that need. In addition, the data suggests that instruction should cover filing rules, cross references, interpretation of bibliographic information in a citation and an explanation of the presence or absence of call numbers or the use of different call number systems (i.e., Dewey and the Library of Congress).[8]

Let's apply what has been learned thus far to the design of an instruction module focusing on the most successful approach to the card catalogue —the author. The need to educate the user about cataloguing codes and local practices becomes immediately apparent.

- If the user has a complete author name and the name is rather unique, then the success rate should be very high; little or no instruction is needed beyond the identification of the basic arrangement of the catalogue (dictionary, divided, etc.).

- If the user has incomplete author information, no title information, and the author name is common (Smith), then the user needs to be guided to directories, biographical dictionaries or to a reference desk. The goal is to teach the user how to enhance an incomplete citation.

- If the user has a citation in which the author is a corporate body, then the principles of choice of main entry become important. And, if the catalogue is very large and very old, multiple cataloguing codes may co-exist within the same catalogue.

- If the author's name is Shakespeare, then uniform entry and filing rules become critical to a user's success.

It is clear that even with a known-item, author approach to a card catalogue, the user education librarian must anticipate points of failure and include basic cataloguing codes and principles as part of user instruction. Therefore, the user education librarian must understand what the points of failure are likely to be and how to apply a cataloguer's philosophy in order to teach the user how to avoid failure.[9]

What have we learned about online catalogues?

The automation of library catalogues produced a plethora of new literature about users and online catalogues. In the United States a nation-wide study funded by the Council on Library

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Resources in the early 1980s anticipated the flood of new research data both in methodology and results. It compared catalogue use and users of several online systems; however, it utilized not only the traditional survey approach but also a new technique "transaction analysis."[10]

Transaction analysis is the recording of all commands issued by a user. all system responses, and the elapsed time for each. It is a reliable technique for recording the use of a system by a user and for analyzing user errors; it does not tell you the users' intentions or if the user was satisfied. Transaction analysis became a popular methodology for catalogue use studies by cataloguers, online system designers and user education librarians. Although their goals were vastly different, the results were strikingly similar and surprisingly different from catalogue use studies in a manual environment.

First of all, the most common search approach was a subject search not an author search. This was discovered in the initial Council for Library Resources study and is still true a decade later. And, in addition, subject searching causes the most user failures. Review articles by Nancy J. Williamson (1984) and Ray P. Larson (1991) summarize the various studies of subject searching in an online environment.[11]

A second difference lies in the errors which cause users failure. Spelling errors in citations are now compounded by user typing errors. No-hits for author names result because a first name is entered before a last name. No-hits for title searches result because an article is used (a, an, the).[12] Users now must not only understand the principles of cataloguing, but they must also understand the difference between using a manual card catalog and an online catalogue. Anne Lipow, in an insightful article about online catalogues, lists major differences between the two. For example, "The online catalog screen offers no visual clues to indicate size of collection and database being searched; no sense that the collection being searched was built over time by human

beings. The card catalog—its size, its interfiling of crisp new cards and yellowing dog-eared cards, its varying type fonts and penciled notes—provides the searcher with that information."[13]

Third, differences in catalogue software produce different search results. Whereas in the past, standardization in catalogue code and classification allowed a school child to move with relative ease between a high school catalogue and a public library catalogue, the superimposition of nonstandardized software brought chaos. Search results in different catalogues are different and the difficulties for a remote user with dial-in equipment are compounded.[14] User education librarians must now teach procedural search techniques and database architecture as well as cataloguing concepts and principles.[15]

The Challenge

The advent of online catalogues, and with them, the ability to review user transactions, offers new opportunities to analyze the impact of cataloguing codes and practices on user behavior. However, the same caveats exist for catalog use studies in an automated environment as in the manual environment. While there may be a typical user, the variation and range of needs is still extraordinary. A novice in one discipline may well be an expert in another. A user in a small public library will utilize the catalogue much more efficiently than the same user would the catalogue of a major research library. The completeness and accuracy of known information will affect the search pattern. The ability to "translate" citation information to catalogue code and filing rules will influence success. Then, there is the question of "What constitutes success"? Is the search a failure if the item is not in the collection or is it successful if the original item is not found, but the user is led to other relevant items during a subject search? In spite of these caveats, the potential for research about user behavior in an online environment is still vastly superior to studies conducted in a manual environment.

Research on user behavior in an online catalogue environment needs to be continued, but the original goal of improving the success rate of the user by changing cataloguing codes or

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practices is now only one part of the challenge to librarians. I believe that research should be broadened to include: 1) the impact of extending the scope and depth of the traditional card catalogue. 2) the impact of cataloguing codes and practices for users of multiple catalogues via state, national or international networks and 3) user interaction as influenced by multi media or hypercard or artificial intelligence.

The results of catalogue use studies in a manual environment did not contribute substantially to the cataloguer's quest to improve user success rate by improving cataloguing. The potential in an online environment for that outcome is greater. However user transactions must be tested against current cataloguing codes and practices. Analyses published to date are still at the identification stage; researchers must move on to the application stage. For example, we know that most users will choose to use author information (if available) on the first or second foray into the catalogue; only then do they use a wider range of catalogue information. Are those other elements different in an online environment? Misspelling of an author's name results in no-hits; should cross references to and from variations of names (even mistakes in typing) be expanded in an online environment or will the flexibility of key word and/or boolean searching on the second or third search attempt obviate the need for the extra work by cataloguers? Those are only two of a myriad of questions which could be studied.

The online catalogue that we know today is virtually a replica of the paper card catalogue that dominated libraries for a hundred years. Automation offers alternatives at reasonable and affordable costs. However, there are many, many questions to be asked about potential impacts on users of extending the scope and depth of the traditional card catalogue. Lets look at a few of the possibilities. 1) Subject headings which are too general or out-dated have been identified as causes for user failure in traditional card catalogues. The technical capacity to instantly and automatically "change" subject headings has the potential to aid the user. But who will "authorize" the change? Who referees the choice between the heading of cancer for lay people and carcinoma for health

science professionals in a catalogue used by both? Will multiple discipline oriented thesauri exist "alongside" or "behind" general subject headings? How will users behave in that environment? 2) Access to monographs in a manual environment was by author, title and a few chosen subject headings. Contents notes could be looked at if the user "found" a card. Automation has enhanced access to information on the "card" by allowing more fields to be indexed. Contents notes are searchable in some online systems. Should the concept of content notes be expanded by adding the table of contents for monographs to the catalogue record? Should indexes of monographs be added to catalogues? Users browse books on shelves using table of contents and/or indexes; that need could now be fulfilled online. How would that best be done? How would users behave in expanded information environment? Would the results be useful and cost effective? 3) For most libraries the main card catalogue has provided access to books and journals. Audio-visual materials, newspapers, microforms, non-roman alphabet materials, maps, manuscripts and government documents often had separate catalogues. MARC standards for many of these formats have aided in expanding the online catalogue to include more than books and journals. However, the fit is not comfortable for all formats. Archival and manuscript cataloguing records are distinctly different from the traditional monograph record. We must understand the problems encountered by a user in an online environment which presents distinctly different looking records. The phenomena will be repeated with art and architectural representations, museum pieces, and geographical information, to name a few. 4) Many libraries have mounted "card catalogues" and "indexes to journals" on a single mainframe. A library menu allows a user to select one or the other. Why not integrate them to allow the user to move seamlessly from article to journal title to call number/location?

All of the above possibilities fall directly within the cataloguers goal of providing the link between the user and information. The other two areas that I suggested for research encompass a wider sphere, but nevertheless, will directly impact your work.

We know that the development and adoption of the UNIMARC format has standardized the layout of online catalogue records, but does this standardization aid the user in moving from one automated environment to another? Evidence is to the contrary. The ability of users to "surf" the internet from one library catalogue to another has brought howls of confusion and consternation. The differences in search software have destroyed the consistency of expectations which you strive to create. You, as catalogue professionals, have been remarkably successful in creating international standards for cataloguing content; perhaps now is the time for you to begin to think about standards for catalogue access and presentation. And, finally, the third area of research involves the new online technologies. How could multi-media hypertalk or artificially intelligent front-ends be used to improve the success rate of the user? I dream of the day when I can whistle a tune to a catalogue screen; first the "card" and then the text of the music and then a video would appear on my screen. MTV via your catalogue! Is that so far fetched?

In summary, the literature of catalogue use studies extends over 50 years, yet there has been little progress toward the goal of increasing user success rates. In fact, we seem to have regressed. Recent studies show even lower user success rates in subject searching in online environment than in manual environment. For cataloguers, the greatest single contribution to user success was—and continues to be the standardization of cataloguing codes and classification both nationally and internationally. There is a predictability to library catalogues in spite of the multiplicity of cataloguing software in today's online environment. For user education librarians that predictability became the guidepost for instruction. Standardization is a key to future success. As librarians, we need to expand the scope of cataloguing beyond its current boundaries, experiment with screen formats and study variations for access. In all cases the effects on users must be studied, but in each case the ultimate goal should be standards predictability brought about by standards.

NOTES

1. James Krikelas, "Catalog Use Studies and Their Implications." *Advances in Librarianship* 3 (October 1972):196

2. Ibid., 217-220.

3. Ibid., 197.

4. Ibid., 210.

5. Ibid., 206.

6. Ibid.

7. Ibid., 202.

8. The following references are examples from user education literature: Anne K. Beaubien, *Learning the Library*, (New York: R.R. Bowker Company, 1982), 168-169; Mary George and Sharon Hogan, "Teaching Tough Stuff: What's 3 x 5 and Full of Holes?," *Research Strategies* 1 (Summer 1983):136-138; ———, "Teaching Tough Stuff: What's 3 x 5 and Full of Holes? Part 2," *Research Strategies* 2 (Winter 1984):50-55. In the United States, the clearinghouse for user education materials is Project LOEX, Center of Educational Resources, Eastern Michigan University, Ypsilanti, MI 48197. Materials that were developed for instruction about the card catalogue are available for loan.

9. Two articles which are particularly insightful for user education librarians are Elizabeth L. Tate, "A Guide for Searching in Anglo-American Main-Entry Catalogs," *Advances in Librarianship* 12 (February 1983):151 172; Martha M. Yee and Raymond Soto, "User Problems with Access to Fictional Characters and Personal Names in Online Public Access Catalogs," *Information Technology and Libraries* 10 (March 1991):3-13.

10. Joseph R. Matthews, Gary S. Lawrence, and Douglas K. Ferguson, *Using Online Catalogs: A Nationwide Survey*. A Report of a Study Sponsored by the Council on Library Resources. (New York:Neal-Schuman Publishers, 1983).

11. Nancy J. Williamson, "Subject Access in the On-Line Environment," *Advances in Librarianship* 13 (September 1984):50-97; Ray R. Larson, "Between Scylla and Charybdis: Subject Searching in the Online Catalog," *Advances in Librarianship* 15 (September 1991):175-236.

12. A particularly detailed article describing patron errors is by Rhonda N. Hunter, "Successes and Failures of Patrons Searching the Online Catalog at a Large Academic Library: A Transaction Log Analysis," *RQ* 30(3) (Spring 1991):395-402.

13. Anne Grodzins Lipow, "The Online Catalog: Exceeding Our Grasp," *American Libraries* 20 (October 1989):863.

14. Problem of off-site patrons are described by Sally Wyman Kalin, "The Invisible Users of Online Catalogs: A Public Services Perspective," *Library Trends* 35 (Spring 1987):587-595.

15. A useful compilation of user education literature about online catalogues is found in Frances C. Nowakowski, "Bibliographic Instruction for Online Public Access Catalogues: An Annotated Bibliography," in *Subject Access and Bibliographic Instruction: Two Sides of the OPAC Problem*. (Halifax, Nova Scotia: Dalhousie University School of Library and Information Studies, 1988), 73-93.

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